K:T
5/30/89

Barr
Engineering Company

7803 Glenroy Road
Minneapolis, MN 55435
612/830-0555

May 30, 1989

Mr. Mark Schmitt
Site Response Section
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

RE: East Hennepin Avenue Site

Dear Mr. Schmitt:

Please find enclosed the Magnolia Aquifer Testing Work Plan - 2010 East Hennepin Avenue Site. This document was prepared by Barr Engineering Co. on behalf of General Mills, Inc.

If you have any questions regarding this work plan, please contact Ray Wuolo or myself.

Sincerely,

Peter J. Sabee

PJS:mrb
Encl.
2327169/MS.WP

MINNESOTA POLLUTION CONTROL AGENCY

Route to:
(1) _____
(2) _____
(3) _____
(4) _____

OFFICE MEMORANDUM

File: General Mills

Location: 2010 East Hennepin Ave. Minneapolis
(City, Village, Township, Section, Range, County, etc.)

Subject: Magnolia Aquifer Testing Work Plan

By Whom: F. Campbell Date: 6-2-89

Investigation ___ Conference ___ Office Field ___ Hearing ___ Meeting ___ Phone ✓

Items to be Covered: (1) Those present and/or those interviewed
(2) Situation
(3) Further action, follow-up, recommendations

(1) I called Ray Wuolo (Barr Engineering Co.)
(2) I told Ray that I had talked to Peter Sabe yesterday about Aquifer Testing Work Plan, and that Peter had referred me to Ray for certain questions. I asked Ray about the 40 to 80 gpm figure for the Magnolia pumping test. Ray said that 80gpm is an upper limit based on the estimated transmissivity and thickness of the Magnolia. He said that they need the recovery test information (on Well 108) to determine more accurate value for transmissivity of Magnolia. I asked Ray about "steady state conditions" following test (recovery) test. These levels would be the levels seen before Well was turned off. I also asked Ray about the use of pressure transducers and the specific choice of wells to connect to data loggers. He said they will probably use TT, VV, OO but it depends on the available equipment. In any case he said they'll probably hand measure TT levels due to delay in reaction of pressure transducers at start-up of pump test. I told Ray that Work Plan looks good
(3) Talk to Mark Schmitt about approving Work Plan ASAP

MINNESOTA POLLUTION CONTROL AGENCY

Route to:
(1) _____
(2) _____
(3) _____
(4) _____

OFFICE MEMORANDUM

File: General Mills

Location: 2010 East Hennepin Ave, Minneapolis
(City, Village, Township, Section, Range, County, etc.)

Subject: Magnolia Aquifer Testing Work Plan

By Whom: F Campbell Date: 6-1-89

Investigation ___ Conference Office ___ Field ___ Hearing ___ Meeting ___ Phone ✓

Items to be Covered: (1) Those present and/or those interviewed
(2) Situation
(3) Further action, follow-up, recommendations

(1) Peter Sabee (Barr Eng.) returned my call

(2) I told Peter that I had a few questions about the proposed work plan. First question was about the first aquifer test (in the Carimona Member). I asked Peter if Well 108 will be pumped at the same rate (ca. 21-28 gpm) that's been used in past. He said that it would, and pointed out that first test is mainly a recovery test to check the hydraulic connection between the Carimona and Magnolia Members and to find out how much of an effect Well 108 has on Magnolia Member. I also asked Peter two questions about the second aquifer test (in the Magnolia Member) I asked him about the 40-80 gpm figure for the Magnolia (aquifer) pumping test. He said that that figure is very general and is subject to modification based on other results and conditions. I asked Peter about the choice of Magnolia wells for monitoring with pressure transducers (i.e. why not include TT?) He said that Ray Wuolo was responsible for selecting wells. Peter will have Ray call me tomorrow to discuss the Aquifer Testing Work Plan.

PQ-00273-01 (8/79) (3) Await call from Ray Wuolo

MAGNOLIA AQUIFER TESTING WORK PLAN
2010 EAST HENNEPIN AVENUE SITE

INTRODUCTION

A provision of the October 23, 1984 Consent Order (Order) requires remediation of the Magnolia member groundwater through operation of a pump-out system comparable to the pump-out system specified for the Carimona member in Sections 1.2.1 through 1.2.4 of Part 1 of the Order. The timetable and strategy for implementation of the Magnolia member pump-out system is presented in the April 25, 1989 Remedial Action Proposal (RAP). The RAP was approved by the Minnesota Pollution Control Agency (MPCA) in a letter dated May 12, 1989.

This document describes the approach and methods which will be used to collect the hydrologic data necessary for the design of an effective Magnolia member pump-out system. The pump-out system will be constructed in the vicinity of the East Hennepin Avenue site (Figure 1).

BACKGROUND

A considerable quantity of data has been gathered at the East Hennepin Avenue site during the period of 1982 through 1989. The data has been gathered by General Mills Inc. as part of site remedial investigation and remedial action monitoring. Some of the data that has been gathered is specific to the water quality and hydraulics of the Carimona and Magnolia members of the Platteville Formation. This data includes 7 years of water quality monitoring and groundwater level measurements, construction of 19 borings and monitoring wells, and an extensive aquifer test of the Carimona member.

The results of these investigations have indicated that: a layer of microgranular limestone present in the upper portion of the Magnolia member appears to separate the Magnolia from the Carimona member; a degree of hydraulic separation exists between the Carimona and Magnolia members; the water levels in both the Carimona and Magnolia members respond to groundwater withdrawals from the Carimona member; the transmissivity of the Carimona member has been calculated to be less than 1,000 gpd/ft in the vicinity of Well 108; the transmissivity of the Magnolia member has been estimated to be between 30,000 and 60,000 gpd/ft; the hydraulic gradient in the Carimona member is approximately 0.0005 ft/ft to the south; the hydraulic gradient

in the Magnolia member is approximately 0.005 ft/ft to the northwest; the concentration of trichloroethene (TCE) in groundwater samples collected from some of the Carimona and Magnolia member monitoring wells exceeds 27 ug/L; and the primary source of TCE in the Magnolia member groundwater appears to be unrelated to the East Hennepin Avenue site.

Pump-out well (Well 108) is currently withdrawing water from the Carimona member of the Platteville Formation as part of site remedial actions. The purpose of pump-out Well 108 is to contain and remediate groundwater in the Carimona member which contains concentrations of TCE which exceed 27 ug/L. The effectiveness of pump-out Well 108 in remediating Carimona groundwater quality is demonstrated by the results from recent laboratory analyses indicating a 70 to 96 percent reduction in the concentration of TCE in most of the Carimona monitoring wells.

APPROACH

The approach which will be followed to collect the hydrologic data necessary for the design of an effective pump-out system involves conducting two aquifer tests and capture zone design using an analytical groundwater model.

The aquifer tests will be conducted in both the Carimona and Magnolia members of the Platteville Formation. The results from the aquifer tests will provide hydraulic data including: the degree of hydraulic separation between the Carimona and Magnolia members; the storage coefficients and the transmissivity of the Magnolia and Carimona members; the vertical hydraulic gradients between the Magnolia and Carimona members; and the location of recharge and discharge boundaries (if any).

The capture zone will be designed using a calibrated analytical groundwater model. The model will be calibrated using the data gathered during the aquifer tests. The results from the model will allow an assessment of: the effectiveness of pump-out Well 108 in containing Magnolia member groundwater; the optimum locations for Magnolia member pump-out wells; the number of wells which will be necessary to implement a Magnolia member groundwater pump-out system; the optimum pumping rates for the pump-out wells; and the effects of pumping in the Magnolia member on the vertical hydraulic gradients between the Magnolia and Carimona members.

METHODS

Two aquifer tests will be performed. The aquifer tests will require the installation of two wells finished in the Magnolia member. One well will be located on Henkel property and the second well will be located in the vicinity of the adjacent railroad right-of-way (Figure 2). The exact locations of the wells will depend upon accessibility and the location of utilities.

The purpose for construction of these wells is to provide groundwater level monitoring points at locations suitable for collection of the data necessary to design an effective groundwater pump-out system, and to provide two Magnolia member wells which can be used as pump-out wells. Specifications for the construction of these wells will be submitted for review and permitting following approval of this work plan to the MPCA, the Minnesota Department of Health, and the City of Minneapolis.

Carimona Member Aquifer Test

The first aquifer test will be conducted in the Carimona member. The pumping well used during the aquifer test will be pump-out Well 108. Aquifer test activities will not commence prior to completion and development of the proposed Magnolia member wells.

Water levels will be measured in all Carimona and Magnolia member monitoring wells, and pressure transducers, connected to data loggers, will be placed in the new Magnolia member wells, existing Magnolia member Well VV, and existing Carimona member wells BB and WW immediately prior to starting the Carimona aquifer test. The pressure transducers will provide continuous water level measurements in these wells.

Pumping of Well 108 will be discontinued for a period of approximately 72 hours following the initial round of water level measurements. During this time period the recovery of water levels in the specified Magnolia and Carimona member wells will be continuously recorded. Periodic water level measurements will also be made during the recovery period in Carimona member wells SS, 12, UU, 9, 8, 10, RR, and 11 (Figure 3) and in Magnolia member wells TT, OO, QQ, and ZZ (Figure 2). Water levels will also be monitored in pump-out Well 108.

After approximately 72 hours of recovery, pump-out Well 108 will be turned back on. Water levels in the specified Carimona and Magnolia member

wells will be measured periodically for 48 to 72 hours after pumping begins. The pumping rate of pump-out Well 108 will also be monitored.

The recovery test of pump-out Well 108 will provide the data necessary to assess the degree of hydraulic connection which exists between the Magnolia and Carimona members. Development of an understanding of the degree of hydraulic connection between the members is necessary for calculation of pumping rates for the Magnolia member pump-out system.

The recovery test will also provide an indication of the quantity of water which is currently being withdrawn from the Magnolia member by Carimona pump-out Well 108. This data may demonstrate the effectiveness of pump-out Well 108 in containing and removing Magnolia member groundwater with TCE concentrations greater than 27 ug/L, and will also allow for calculation of an estimated cumulative effect resulting from the pumping of the new Magnolia member wells in conjunction with pumping of existing pump-out Well 108.

The results of water level monitoring in the Carimona member wells during the recovery test will also provide a check on the calculated transmissivity and storage coefficient for the Carimona Member.

The data generated following the recovery test and during start up of pump-out Well 108 will be used to provide a check on the results from the recovery test.

Magnolia Member Aquifer Test

The second aquifer test will be conducted in the Magnolia member. The pumping well used during the aquifer test will be the new Magnolia member well located on the Henkel property. The Magnolia member aquifer test will be conducted following completion of the first aquifer test. The first aquifer test will be considered complete when water levels in the Magnolia and Carimona member wells have reached approximate steady state conditions. A pumping rate of between 40 and 80 gallons per minute (gpm) will likely be required for the Magnolia member aquifer test. Pump-out Well 108 will be operating during this test.

Pressure transducers connected to data loggers will be placed in the Magnolia member pumping well, the other new Magnolia member well and existing Magnolia member Wells VV, and OO. Water levels during the pumping test will also be monitored periodically in existing Magnolia member Wells TT, QQ, and

ZZ; in existing Carimona member Wells BB, SS, RR, WW, 11, 12, and 108. The pumping test will continue for 72 hours. A 72 hour recovery test will follow pumping, during which time water levels will continue to be monitored. Pumped water will be discharged to the Minneapolis stormwater system.

The Magnolia member pumping test will provide the data necessary to calculate transmissivity, storage coefficient, and the locations of local recharge and discharge boundaries, if any. The effects of pumping the Magnolia member on water levels in the Carimona member will be assessed by monitoring water levels in selected wells finished in the Carimona member. Of particular concern will be the effects of pumping on the vertical hydraulic gradients between the Magnolia member and the Carimona member.

Capture Zone Design

The results of the aquifer tests will be used to develop a groundwater flow model for the Magnolia member. The modeling will be conducted using the analytic element flow code SLAEM. The model will be calibrated to the observed steady state piezometric surface of the Magnolia member. Various pumping scenarios will be examined.

The results of flow modelling will be used to: determine the pumping rates necessary to achieve capture of groundwater in the Magnolia member; to determine the optimum pumping rates for each pump-out well; to determine design flow rates; and to select pumps. The results of the flow modeling will be presented in the remedial action design plan.

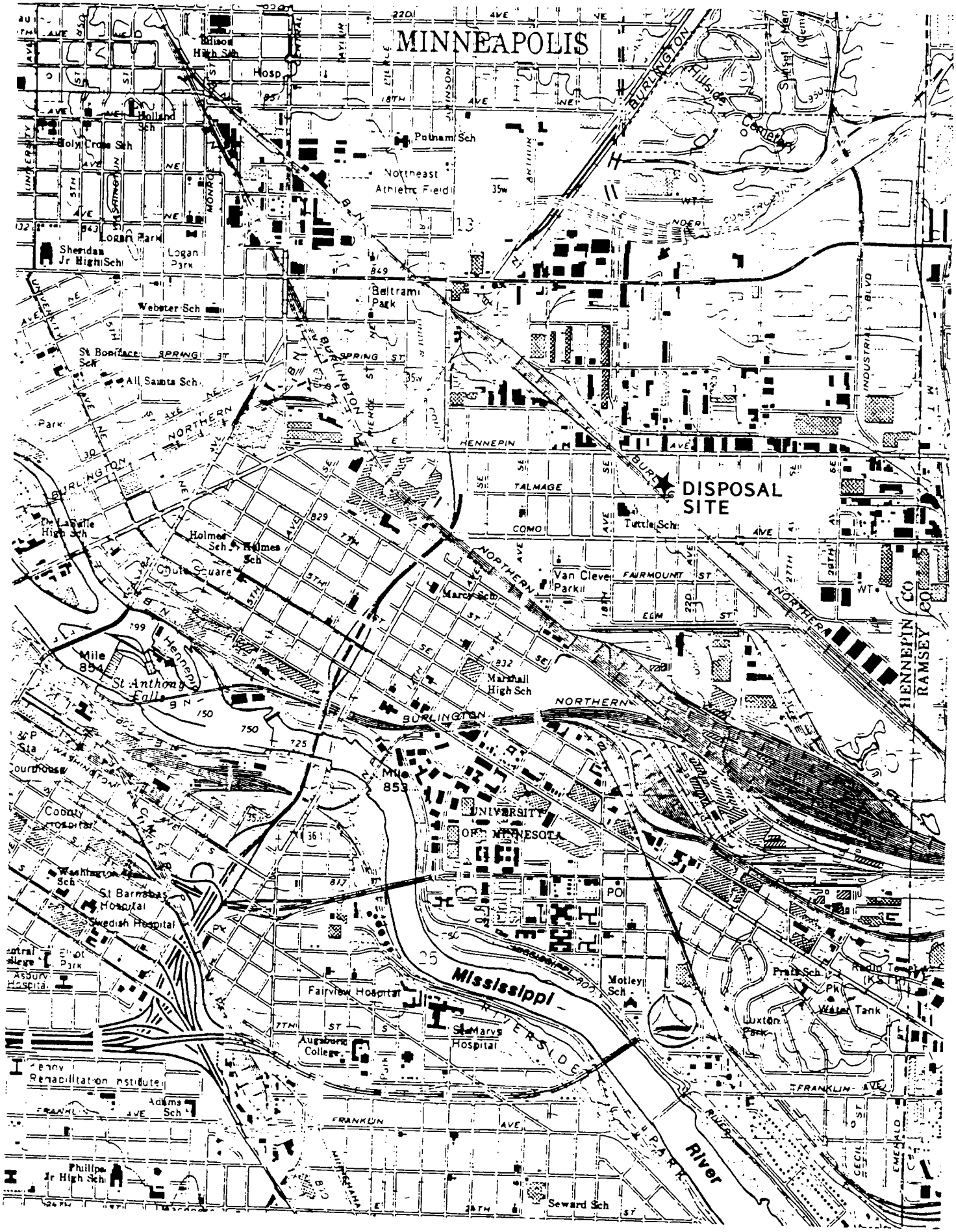

Figure 1
LOCATION OF DISPOSAL SITE

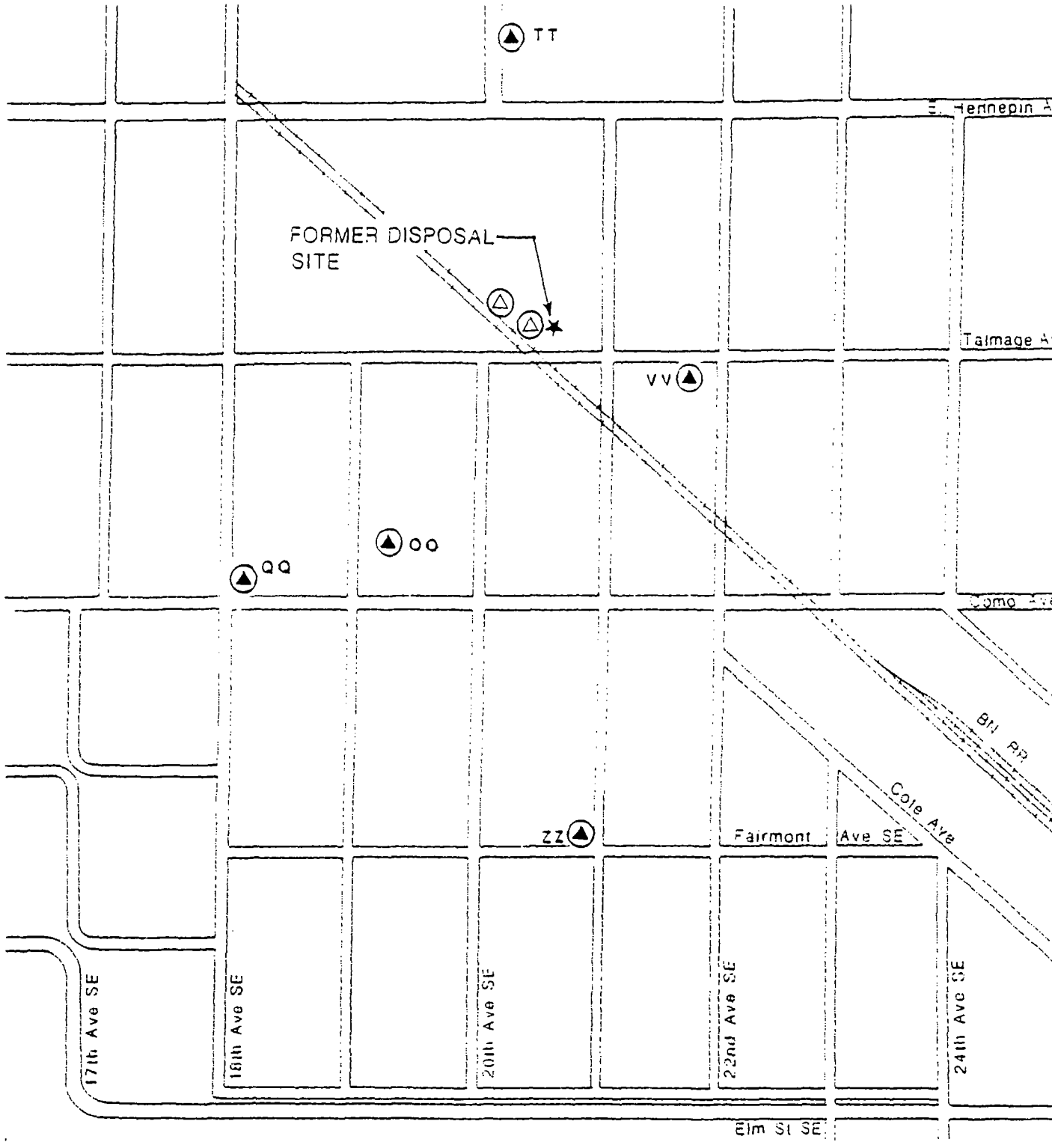

Figure 2

MAGNOLIA MEMBER
MONITORING LOCATIONS

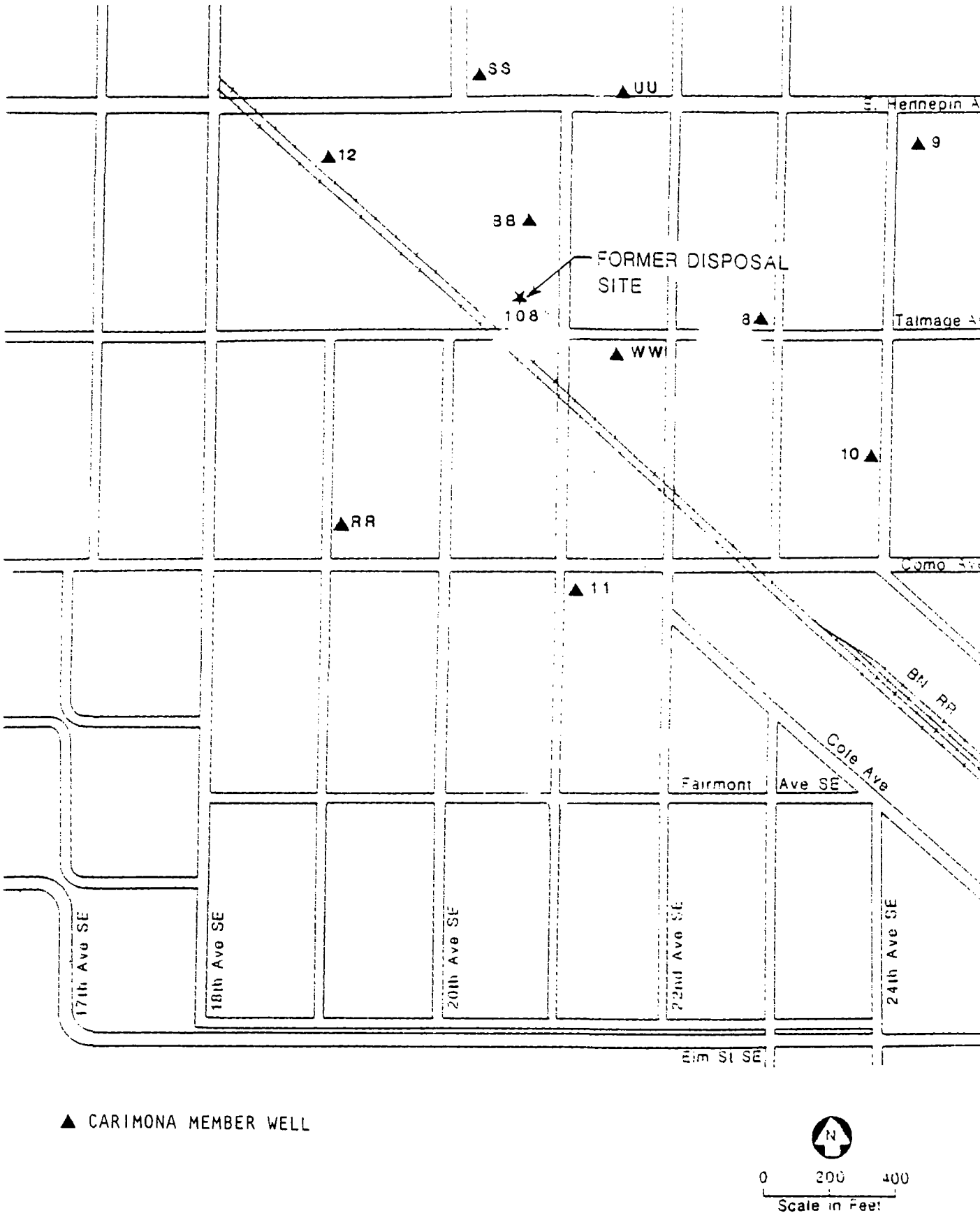

Figure 3

CARIMONA MEMBER
MONITORING LOCATIONS